

# Complementary Darlington Power Transistors

## DPAK For Surface Mount Applications

### MJD112 (NPN), MJD117 (PNP)

Designed for general purpose power and switching such as output or driver stages in applications such as switching regulators, converters, and power amplifiers.

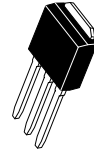
#### Features

- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves (“-1” Suffix)
- Electrically Similar to Popular TIP31 and TIP32 Series
- NJV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant\*

SILICON  
POWER TRANSISTORS  
2 AMPERES  
100 VOLTS, 20 WATTS

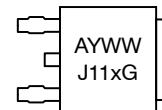


DPAK  
CASE 369C

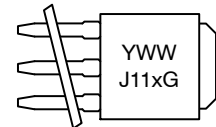


DPAK-3  
CASE 369D

#### MARKING DIAGRAMS



DPAK



DPAK-3

A = Assembly Location  
Y = Year  
WW = Work Week  
x = 2 or 7  
G = Pb-Free Package

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## MJD112 (NPN), MJD117 (PNP)

### MAXIMUM RATINGS

| Rating                                                                                           | Symbol         | Max           | Unit                     |
|--------------------------------------------------------------------------------------------------|----------------|---------------|--------------------------|
| Collector–Emitter Voltage                                                                        | $V_{CEO}$      | 100           | Vdc                      |
| Collector–Base Voltage                                                                           | $V_{CB}$       | 100           | Vdc                      |
| Emitter–Base Voltage                                                                             | $V_{EB}$       | 5             | Vdc                      |
| Collector Current<br>Continuous<br>Peak                                                          | $I_C$          | 2<br>4        | Adc                      |
| Base Current                                                                                     | $I_B$          | 50            | mAdc                     |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$         | $P_D$          | 20<br>0.16    | W<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation (Note1)<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.75<br>0.014 | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range                                                 | $T_J, T_{stg}$ | –65 to +150   | $^\circ\text{C}$         |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

| Characteristic                                   | Symbol          | Max  | Unit                      |
|--------------------------------------------------|-----------------|------|---------------------------|
| Thermal Resistance, Junction–to–Case             | $R_{\theta JC}$ | 6.25 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction–to–Ambient (Note 1) | $R_{\theta JA}$ | 71.4 | $^\circ\text{C}/\text{W}$ |

1. These ratings are applicable when surface mounted on the minimum pad sizes recommended.



# MJD112 (NPN), MJD117 (PNP)

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic                                                                                                                                                                | Symbol        | Min                | Max              | Unit          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|------------------|---------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                    |               |                    |                  |               |
| Collector-Emitter Sustaining Voltage (Note 2)<br>( $I_C = 30\text{ mA}$ , $I_B = 0$ )                                                                                         | $V_{CE(sus)}$ | 100                | –                | Vdc           |
| Collector Cutoff Current<br>( $V_{CE} = 50\text{ Vdc}$ , $I_B = 0$ )                                                                                                          | $I_{CEO}$     | –                  | 20               | $\mu\text{A}$ |
| Collector Cutoff Current<br>( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ )                                                                                                         | $I_{CBO}$     | –                  | 20               | $\mu\text{A}$ |
| Emitter Cutoff Current<br>( $V_{BE} = 5\text{ Vdc}$ , $I_C = 0$ )                                                                                                             | $I_{EBO}$     | –                  | 2                | mA            |
| Collector-Cutoff Current<br>( $V_{CB} = 80\text{ Vdc}$ , $I_E = 0$ )                                                                                                          | $I_{CBO}$     | –                  | 10               | $\mu\text{A}$ |
| Emitter-Cutoff Current<br>( $V_{BE} = 5\text{ Vdc}$ , $I_C = 0$ )                                                                                                             | $I_{EBO}$     | –                  | 2                | mA            |
| <b>ON CHARACTERISTICS</b>                                                                                                                                                     |               |                    |                  |               |
| DC Current Gain<br>( $I_C = 0.5\text{ A}$ , $V_{CE} = 3\text{ Vdc}$ )<br>( $I_C = 2\text{ A}$ , $V_{CE} = 3\text{ Vdc}$ )<br>( $I_C = 4\text{ A}$ , $V_{CE} = 3\text{ Vdc}$ ) | $h_{FE}$      | 500<br>1000<br>200 | –<br>12,000<br>– | –             |
| Collector-Emitter Saturation Voltage<br>( $I_C = 2\text{ A}$ , $I_B = 8\text{ mA}$ )<br>( $I_C = 4\text{ A}$ , $I_B = 40\text{ mA}$ )                                         | $V_{CE(sat)}$ | –<br>–             | 2<br>3           | Vdc           |
| Base-Emitter Saturation Voltage<br>( $I_C = 4\text{ A}$ , $I_B = 40\text{ mA}$ )                                                                                              | $V_{BE(sat)}$ | –                  | 4                | Vdc           |
| Base-Emitter On Voltage<br>( $I_C = 2\text{ A}$ , $V_{CE} = 3\text{ Vdc}$ )                                                                                                   | $V_{BE(on)}$  | –                  | 2.8              | Vdc           |
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                                                                |               |                    |                  |               |
| Current-Gain – Bandwidth Product<br>( $I_C = 0.75\text{ A}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1\text{ MHz}$ )                                                                 | $f_T$         | 25                 | –                | MHz           |
| Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 0.1\text{ MHz}$ )<br>MJD117, NJVMJD117T4G<br>MJD112, NJVMJD112G, NJVMJD112T4G                             | $C_{ob}$      | –<br>–             | 200<br>100       | pF            |

2. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

\*These ratings are applicable when surface mounted on the minimum pad sizes recommended.



# MJD112 (NPN), MJD117 (PNP)

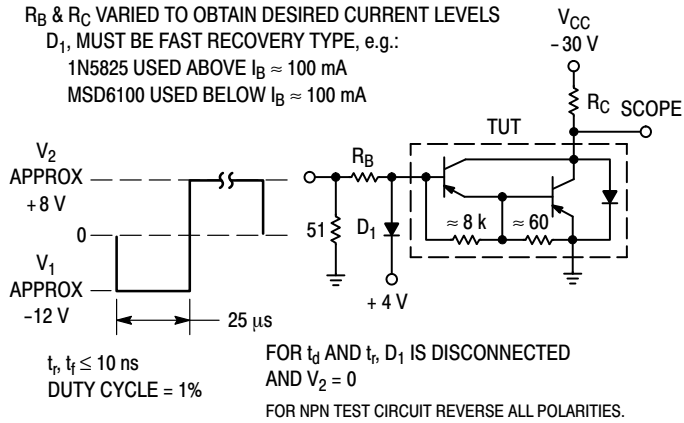


Figure 1. Switching Times Test Circuit

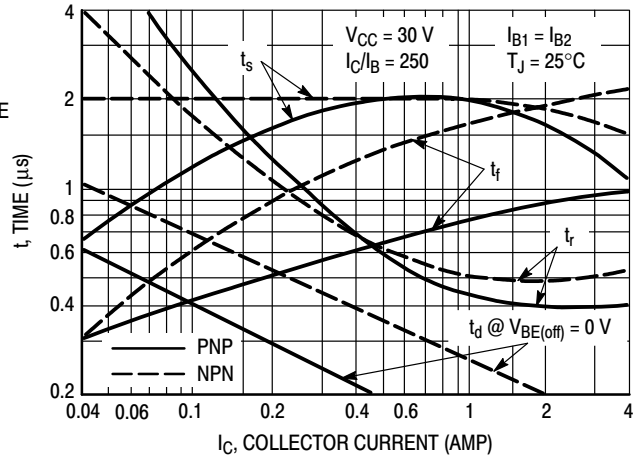


Figure 2. Switching Times

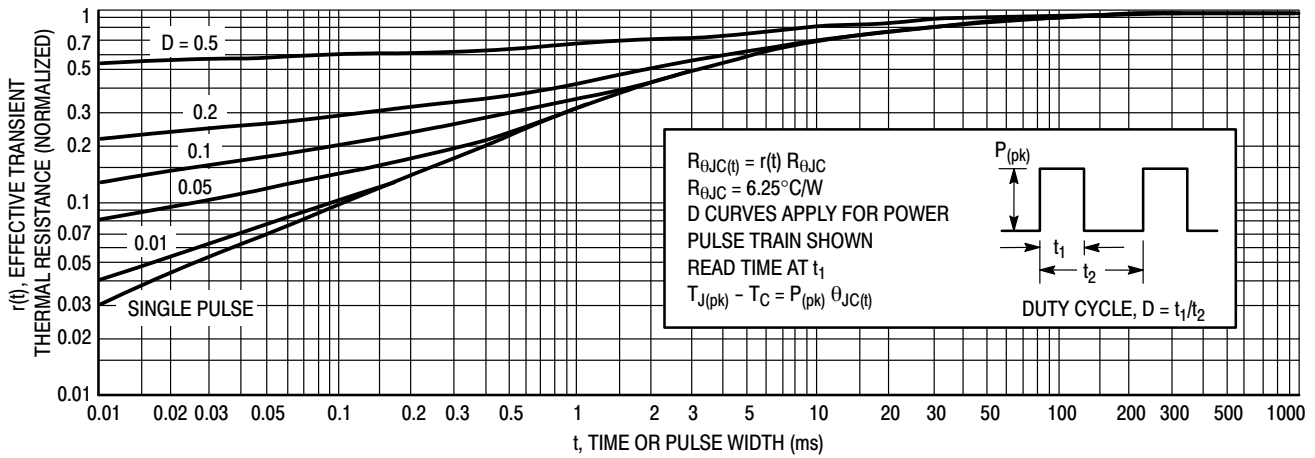
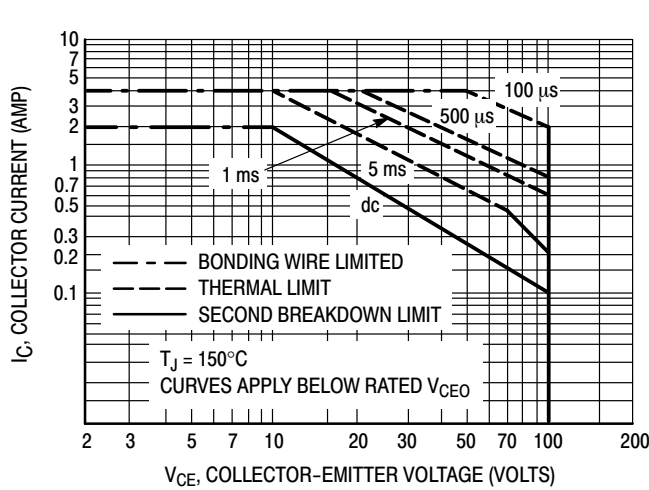


Figure 3. Thermal Response

# MJD112 (NPN), MJD117 (PNP)

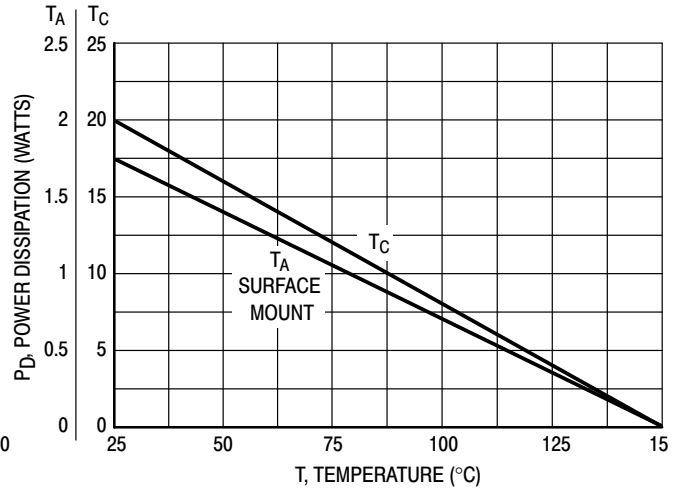
## ACTIVE-REGION SAFE-OPERATING AREA



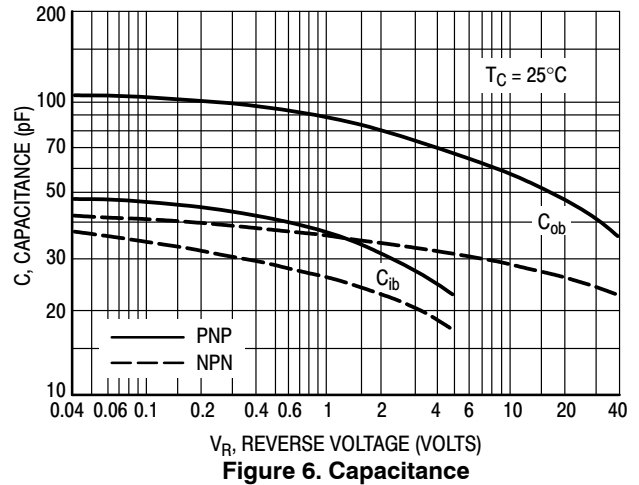
**Figure 4. Maximum Rated Forward Biased Safe Operating Area**

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figures 5 and 6 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} < 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.



**Figure 5. Power Derating**



**Figure 6. Capacitance**

# MJD112 (NPN), MJD117 (PNP)

## TYPICAL ELECTRICAL CHARACTERISTICS

NPN MJD112

PNP MJD117

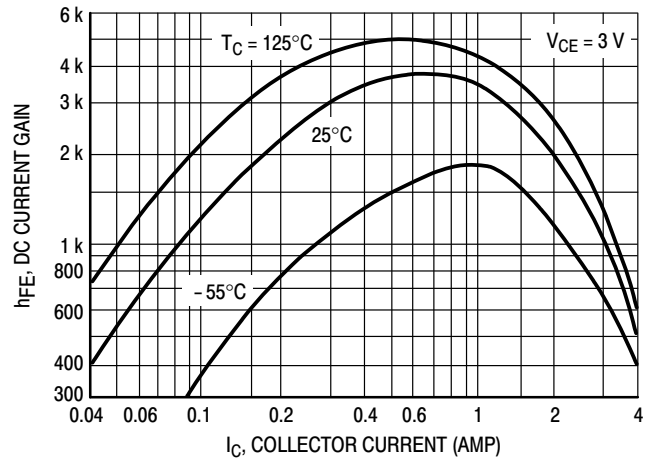
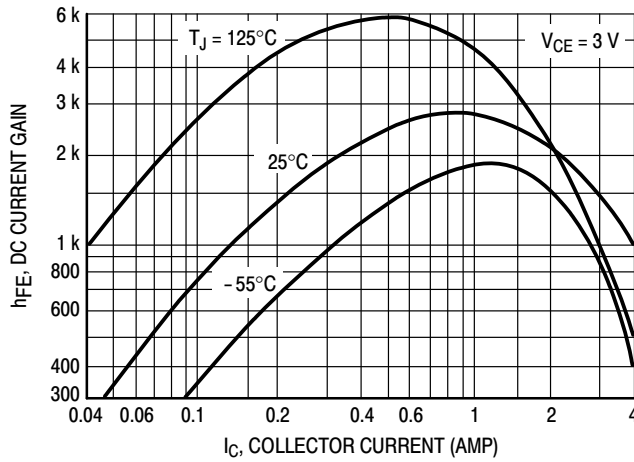


Figure 7. DC Current Gain

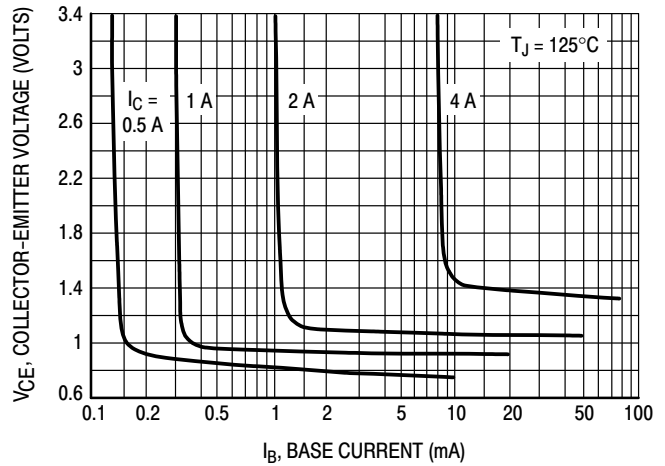
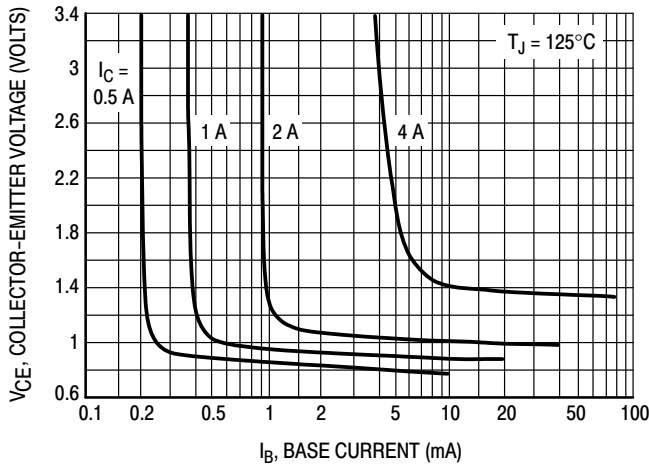


Figure 8. Collector Saturation Region

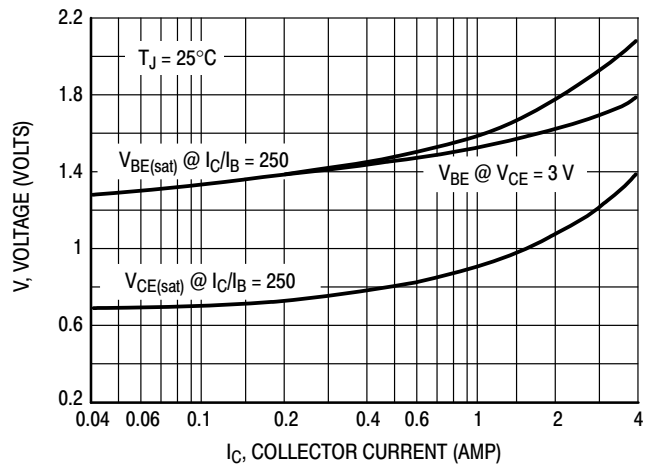
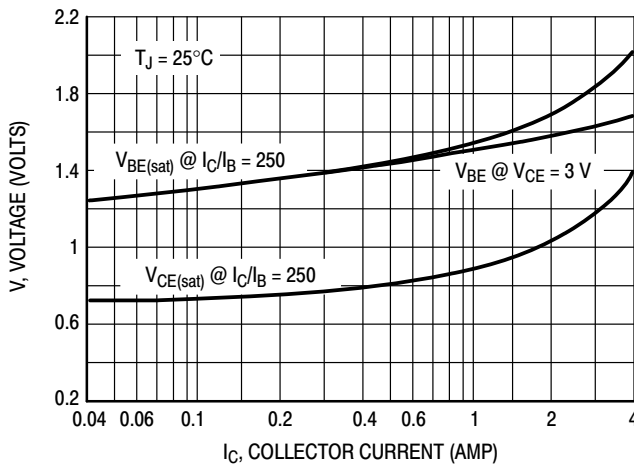


Figure 9. "On Voltages"

# MJD112 (NPN), MJD117 (PNP)

NPN MJD112

PNP MJD117

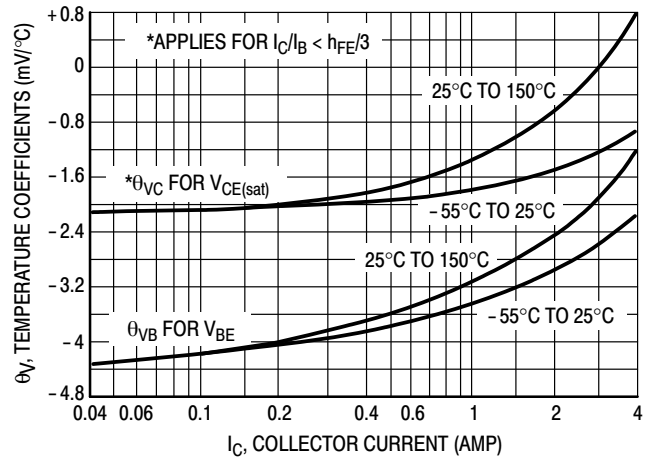
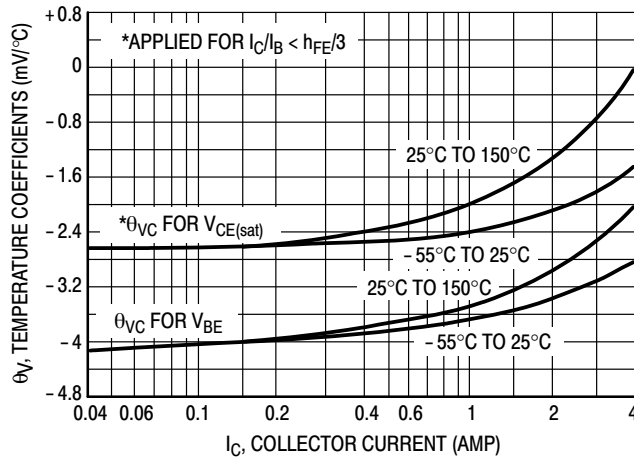


Figure 10. Temperature Coefficients

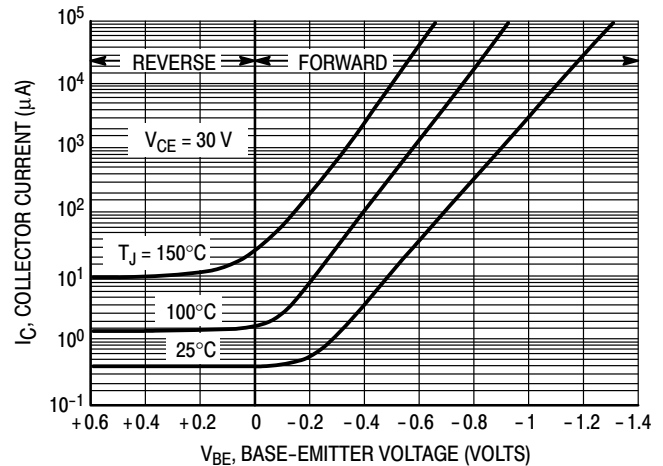
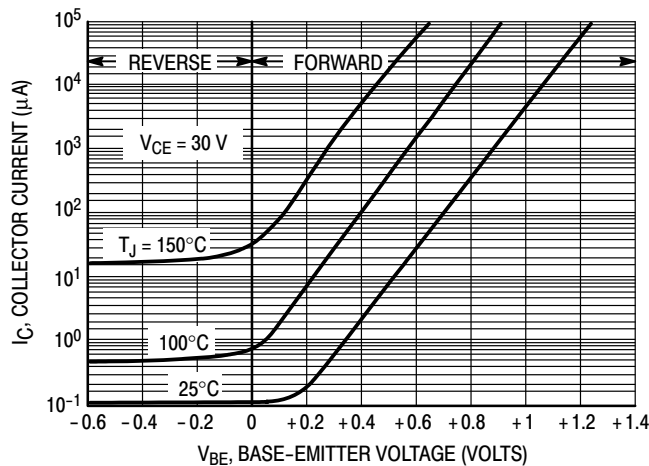


Figure 11. Collector Cut-Off Region

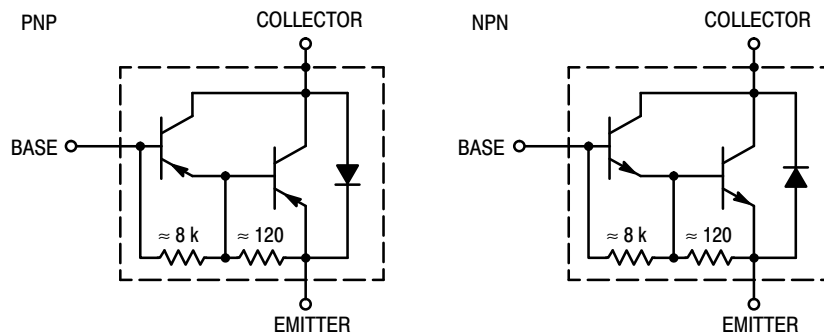


Figure 12. Darlington Schematic

## MJD112 (NPN), MJD117 (PNP)

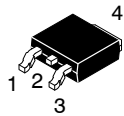
### ORDERING INFORMATION

| Device        | Package Type        | Package | Shipping <sup>†</sup> |
|---------------|---------------------|---------|-----------------------|
| MJD112G       | DPAK<br>(Pb-Free)   | 369C    | 75 Units / Rail       |
| NJVMJD112G*   | DPAK<br>(Pb-Free)   | 369C    | 75 Units / Rail       |
| MJD112-1G     | DPAK-3<br>(Pb-Free) | 369D    | 75 Units / Rail       |
| MJD112RLG     | DPAK<br>(Pb-Free)   | 369C    | 1,800 Tape & Reel     |
| MJD112T4G     | DPAK<br>(Pb-Free)   | 369C    | 2,500 Tape & Reel     |
| NJVMJD112T4G* | DPAK<br>(Pb-Free)   | 369C    | 2,500 Tape & Reel     |
| MJD117G       | DPAK<br>(Pb-Free)   | 369C    | 75 Units / Rail       |
| MJD117-1G     | DPAK-3<br>(Pb-Free) | 369D    | 75 Units / Rail       |
| MJD117RLG     | DPAK<br>(Pb-Free)   | 369C    | 1,800 Tape & Reel     |
| MJD117T4G     | DPAK<br>(Pb-Free)   | 369C    | 2,500 Tape & Reel     |
| NJVMJD117T4G* | DPAK<br>(Pb-Free)   | 369C    | 2,500 Tape & Reel     |

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*NJV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

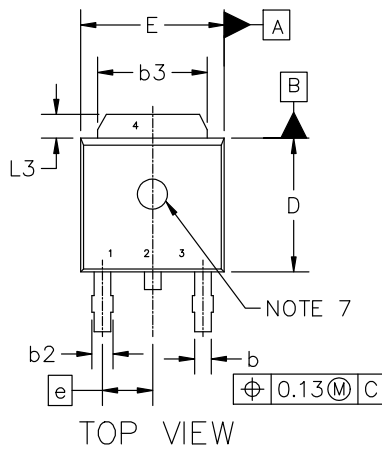




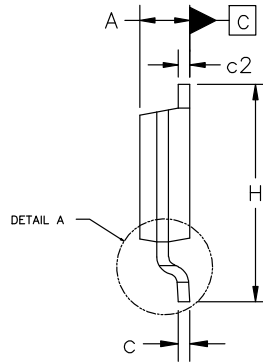
SCALE 1:1

**DPAK-3 6.10x6.54x2.28, 2.29P**  
**CASE 369C**  
**ISSUE L**

DATE 24 AUG 2026

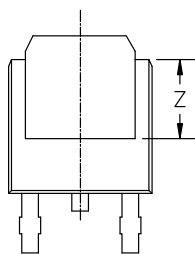


TOP VIEW

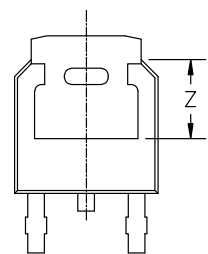
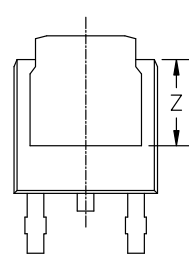
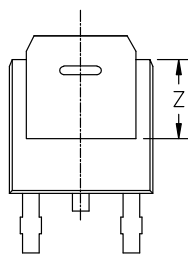
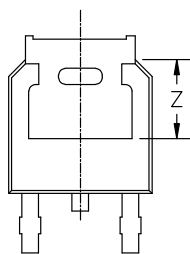


SIDE VIEW

| MILLIMETERS |          |      |       |
|-------------|----------|------|-------|
| DIM         | MIN      | NOM  | MAX   |
| A           | 2.18     | 2.28 | 2.38  |
| A1          | 0.00     | ---  | 0.13  |
| b           | 0.63     | 0.76 | 0.89  |
| b2          | 0.72     | 0.93 | 1.14  |
| b3          | 4.57     | 5.02 | 5.46  |
| c           | 0.46     | 0.54 | 0.61  |
| c2          | 0.46     | 0.54 | 0.61  |
| D           | 5.97     | 6.10 | 6.22  |
| E           | 6.35     | 6.54 | 6.73  |
| e           | 2.29 BSC |      |       |
| H           | 9.40     | 9.91 | 10.41 |
| L           | 1.40     | 1.59 | 1.78  |
| L1          | 2.90 REF |      |       |
| L2          | 0.51 BSC |      |       |
| L3          | 0.89     | ---  | 1.27  |
| L4          | ---      | ---  | 1.01  |
| Z           | 3.93     | ---  | ---   |



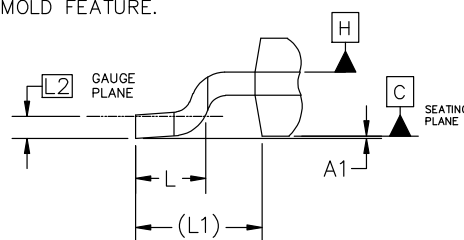
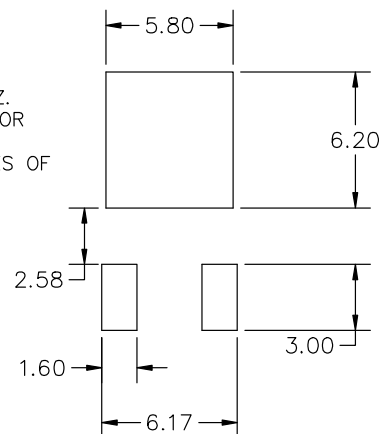
BOTTOM VIEW



ALTERNATE CONSTRUCTIONS

## NOTES:

1. DIMENSIONING AND TOLERANCING ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3, AND Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.


DETAIL A  
ROTATED 90° CW

**RECOMMENDED MOUNTING FOOTPRINT\***

\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques reference manual, SOLDERM/D.

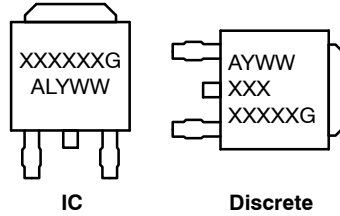
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| <b>DOCUMENT NUMBER:</b> | <b>98AON10527D</b>                  | Electronic versions are uncontrolled except when accessed directly from the Document Repository.<br>Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>DPAK-3 6.10x6.54x2.28, 2.29P</b> | <b>PAGE 1 OF 2</b>                                                                                                                                                                  |

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**DDAK-3 6.10x6.54x2.28, 2.29P**  
CASE 369C  
ISSUE L

DATE 24 AUG 2026

**GENERIC  
MARKING DIAGRAM\***



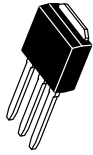
XXXXXX = Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
WW = Work Week  
G = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

|                                                                       |                                                                       |                                                                  |                                                                            |                                                                   |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------|
| STYLE 1:<br>PIN 1. BASE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | STYLE 2:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE<br>4. DRAIN          | STYLE 3:<br>PIN 1. ANODE<br>2. CATHODE<br>3. ANODE<br>4. CATHODE | STYLE 4:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE<br>4. ANODE              | STYLE 5:<br>PIN 1. GATE<br>2. ANODE<br>3. CATHODE<br>4. ANODE     |
| STYLE 6:<br>PIN 1. MT1<br>2. MT2<br>3. GATE<br>4. MT2                 | STYLE 7:<br>PIN 1. GATE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | STYLE 8:<br>PIN 1. N/C<br>2. CATHODE<br>3. ANODE<br>4. CATHODE   | STYLE 9:<br>PIN 1. ANODE<br>2. CATHODE<br>3. RESISTOR ADJUST<br>4. CATHODE | STYLE 10:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE<br>4. ANODE |

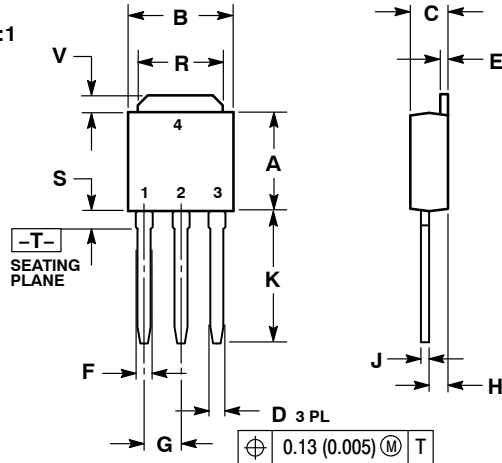
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|-------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NUMBER:</b> | <b>98AON10527D</b>                  | Electronic versions are uncontrolled except when accessed directly from the Document Repository.<br>Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>DDAK-3 6.10x6.54x2.28, 2.29P</b> | <b>PAGE 2 OF 2</b>                                                                                                                                                                  |

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**IPAK**  
**CASE 369D**  
**ISSUE C**

DATE 15 DEC 2010

SCALE 1:1

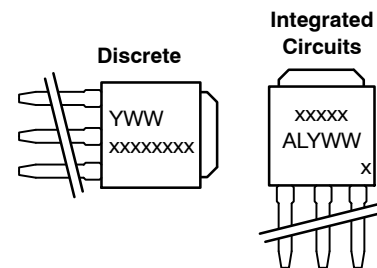


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES |       | MILLIMETERS |      |
|-----|--------|-------|-------------|------|
|     | MIN    | MAX   | MIN         | MAX  |
| A   | 0.235  | 0.245 | 5.97        | 6.35 |
| B   | 0.250  | 0.265 | 6.35        | 6.73 |
| C   | 0.086  | 0.094 | 2.19        | 2.38 |
| D   | 0.027  | 0.035 | 0.69        | 0.88 |
| E   | 0.018  | 0.023 | 0.46        | 0.58 |
| F   | 0.037  | 0.045 | 0.94        | 1.14 |
| G   | 0.090  | BSC   | 2.29        | BSC  |
| H   | 0.034  | 0.040 | 0.87        | 1.01 |
| J   | 0.018  | 0.023 | 0.46        | 0.58 |
| K   | 0.350  | 0.380 | 8.89        | 9.65 |
| R   | 0.180  | 0.215 | 4.45        | 5.45 |
| S   | 0.025  | 0.040 | 0.63        | 1.01 |
| V   | 0.035  | 0.050 | 0.89        | 1.27 |
| Z   | 0.155  | ---   | 3.93        | ---  |

**GENERIC MARKING**  
**DIAGRAMS**

- STYLE 1:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR
- STYLE 2:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN
- STYLE 3:  
PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. CATHODE
- STYLE 4:  
PIN 1. CATHODE  
2. ANODE  
3. GATE  
4. ANODE
- STYLE 5:  
PIN 1. GATE  
2. ANODE  
3. CATHODE  
4. ANODE
- STYLE 6:  
PIN 1. MT1  
2. MT2  
3. GATE  
4. MT2
- STYLE 7:  
PIN 1. GATE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR



xxxxxxxx = Device Code  
A = Assembly Location  
IL = Wafer Lot  
Y = Year  
WW = Work Week

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

|                         |                                    |                                                                                                                                                                                     |
|-------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| <b>DESCRIPTION:</b>     | <b>IPAK (DPAK INSERTION MOUNT)</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

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